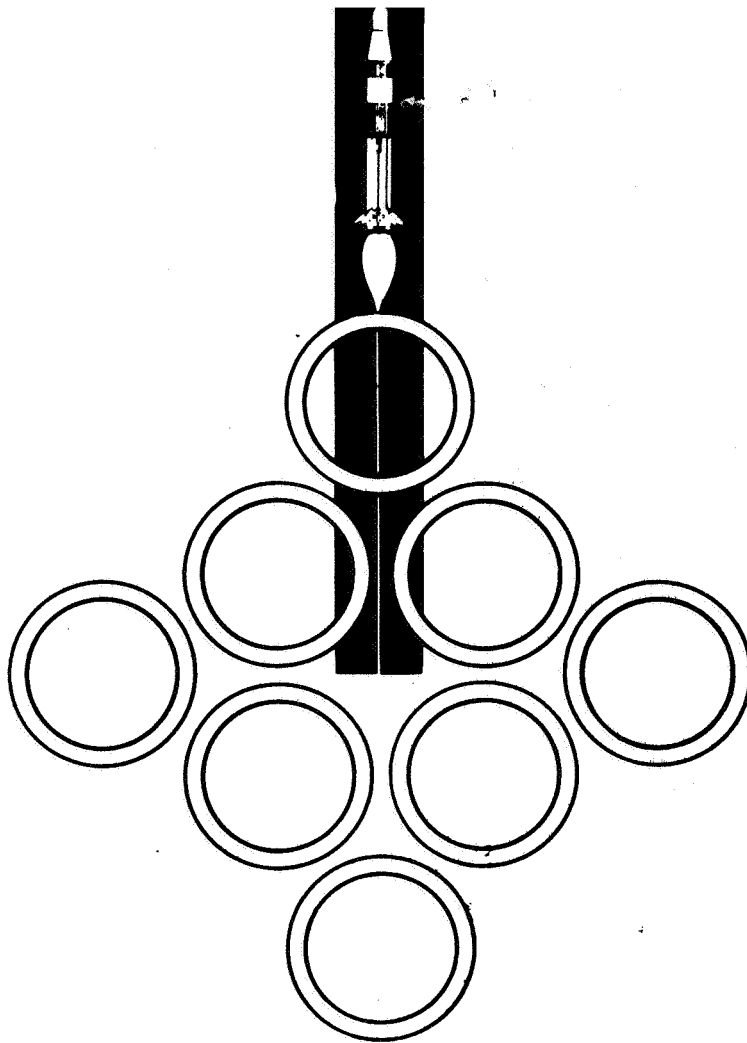


1307

ENGINEERING DEPARTMENT
TECHNICAL REPORT

TR-RE-CCSD-FO-1133-3

May 9, 1967



SATURN IB PROGRAM

TEST REPORT
FOR
PRESSURE SWITCH

Custom Components Switches, Inc. Part Number 8G46-1

NASA Drawing Number 10430405

Facility Form 602

N67-36090

(ACCESSION NUMBER)

142250

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SPACE DIVISION



CHRYSLER
CORPORATION

TEST REPORT

FOR

PRESSURE SWITCH

Custom Components Switches, Inc. Part Number 8G46-1

NASA Drawing Number 10430405

ABSTRACT

This report presents the results of tests performed on three specimens of Pressure Switch 10430405. The following tests were performed:

- | | |
|-------------------------|---------------------|
| 1. Receiving Inspection | 5. Low Temperature |
| 2. Proof Pressure | 6. High Temperature |
| 3. Functional | 7. Humidity |
| 4. Vibration | 8. Salt Fog |

The results of the tests were satisfactory and the performance of the test specimens was in accordance with specification requirements.

4th TEST REPORT (

F 41 9

FOR

3 PRESSURE SWITCH,

Custom Components Switches, Inc. Part Number 8G46-1,

NASA Drawing Number 10430405 4

9 May 9, 1967

CHRYSLER CORPORATION SPACE DIVISION - NEW ORLEANS, LOUISIANA

FOREWORD

The tests reported herein were conducted for the John F. Kennedy Space Center by Chrysler Corporation Space Division (CCSD), New Orleans, Louisiana. This document was prepared by CCSD under contract NAS 8-4016, Part VII, CWO 271620.

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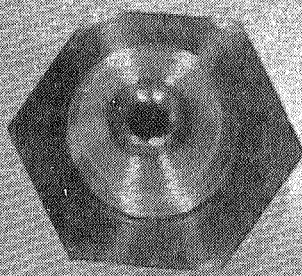
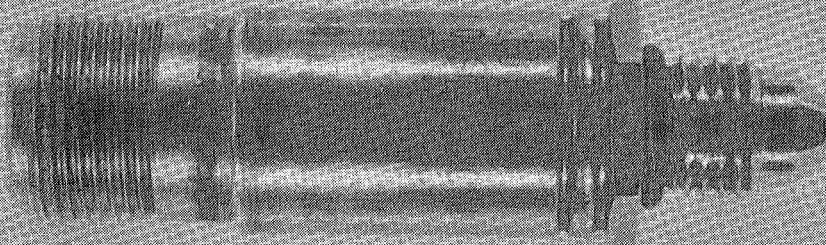
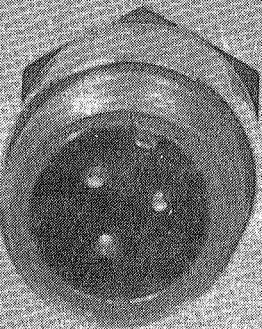
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**CUSTOM COMPONENTS
SWITCHES, INC.
PRESSURE SWITCH**

FO - 1133

CHECK SHEET

FOR

PRESSURE SWITCH

MANUFACTURER: Custan Components Switches, Inc,
3137 Kenwood
Burbank, California
MANUFACTURERS PART NUMBER: 8G46-1
NASA DRAWING NUMBER: 10430405
TESTING AGENCY: Chrysler Corporation Space Division, New Orleans,
Louisiana
AUTHORIZING AGENCY: NASA KSC

I. FUNCTIONAL REQUIREMENTS

- | | |
|------------------------|--|
| A. OPERATING MEDIUM: | Dry air, gaseous nitrogen, and gaseous helium |
| B. OPERATING PRESSURE: | Actuates at 15 (± 5)psig, deactuates at not less than 5 psig.
Maximum of 3000 psig. |
| C. LEAKAGE: | Bubble tight at 4500 psig |
| D. PROOF PRESSURE: | 4500 psig |
| E. BURST PRESSURE: | 7500 psig |
| F. CONTACT RATING: | One ampere resistive at 28 vdc |

II. CONSTRUCTION, MECHANICAL

- | | |
|------------------------------|---|
| A. PRESSURE SENSING ELEMENT: | Diaphragm with disc (Belleville) spring |
| B. MATERIAL: | 18-8 stainless steel |
| C. PNEUMATIC CONNECTION: | MC 172-4 |
| D. WEIGHT: | 2 ounces |

III. CONSTRUCTION, ELECTRICAL

- | | |
|---------------------------|---|
| A. CONNECTOR: | GS02-10SL-3P |
| B. CONTACT VOLTAGE DROP: | 0.300 volt maximum at rated load |
| C. INSULATION RESISTANCE: | 20 megohms at 500 vdc minimum |
| D. DIELECTRIC STRENGTH: | 1000 v rms, 60 cps for 60 seconds maximum |

IV. ENVIRONMENT CHARACTERISTICS - MANUFACTURER'S SPECIFICATIONS

- | | |
|-----------------------|---------------|
| A. TEMPERATURE RANGE: | -40 to +160°F |
|-----------------------|---------------|

V. LOCATION AND USE

The switch is used at Launch Complexes 34 and 37B to indicate the presence or absence of gas pressure.

TEST SUMMARY
PRESSURE SWITCH
10430405

Environment	Units	Operational Boundary	Test Objective	Test Results	Remarks
Receiving Inspection	1	Visual Examination	To determine if specimens conform with applicable drawings and specifications	S	
	2			S	
	3			S	
Proof Pressure Test	1	4500 psig for 5 minutes	Maintain 4500 psig	S	
	2			S	
	3			S	
Functional Test a. Actuation and deactuation	1	Actuate on increasing pressure at 15(+5) psig; deactuate on decreasing pressure at or before 5 psig	Actuate and deactuate test specimens 10 times each at specified levels	S	
	2			S	
	3			S	
b. Contact Voltage Drop	1	Apply a 1 ampere 28 vdc resistive load across closed contacts	Voltage drop shall not exceed 300 millivolts	S	
	2			S	
	3			S	
c. Insulation Resistance	1	500 vdc applied between non-connected pins and between each pin and switch case	Insulation resistance not less than 20 megohms	S	
	2			S	
	3			S	
d. Dielectric Strength	1	1000 vac (rms), 60cps applied between non-connected pins and between each pin and switch case	Leakage current not greater than 3 milliamperes	S	
	2			S	
	3			S	
Vibration Test a. Resonant Frequency Search	1	Vibrate specimens from 5 to 3000 to 5 cps at specified levels for 15 minutes	Determine the resonant frequencies of the test specimens	S	
	3			S	

TEST SUMMARY
PRESSURE SWITCH

10430405

(continued)

Environment	Units	Operational Boundary	Test Objective	Test Results	Remarks
b. Sinusoidal Sweep	1	Vibrate specimens from 10 to 2000 to 10 cps at specified levels for 15 minutes	Determine operating ability during vibration and after being subjected to a vibration environment	S	
	3			S	
c. Random Excitation	1	Vibrate specimens for 5 minutes at specified levels	Determine operating ability during vibration and after being subjected to a vibration environment	S	
	3			S	
Low Temperature Test	1	Stabilize at 5°F, perform a functional test at low temperature, and return to ambient conditions	Determine whether low temperature causes degradation or deterioration of the specimens	S	
	3			S	
High Temperature Test	1	Stabilize at 160°F for 72 hours; perform a functional test at high temperature and return to ambient conditions	Determine whether high temperature causes degradation or deterioration of the specimens	S	
	3			S	
Humidity Test	2	240 hours of humidity environment; vary temperature from ambient to 160°F to ambient during each 24 hour period maintaining 95 per cent humidity	Determine if humid environment causes degradation or deterioration of test specimens	S	
	3			S	

(continued)

ix

SECTION I

INTRODUCTION

1.1

SCOPE

This report presents the results of tests that were performed to determine if Pressure Switch 10430405 meets the operational and environmental requirements of the John F. Kennedy Space Center. A *summary* of the test results is presented on pages vii through ix.

1.2

ITEM DESCRIPTION

1.2.1

Three specimens of Pressure Switch 10430405 were tested. The switches are manufactured by Custom Components Switches, Inc. as vendor part number 8G46-1. The switch is adjusted to operate on increasing pressure at 15 (+5) psig and on decreasing pressure at not less than 5 psig.

1.2.2

The switches are mounted directly into the pressure line and are used to indicate the presence or absence of gas pressure,

1.3

APPLICATION

The following documents contain the requirements for Pressure Switch 10430405:

- a. KSC-STD-164(D), Standard Environmental Test Methods for Ground Support Equipment Installation at Cape Kennedy,
- b. NASA Drawing 10430405
- c. Test Plan CCSD-FO-1133-1R

SECTION II

RECEIVING INSPECTION

2.1 TEST REQUIREMENTS

Each test specimen shall be **visually** and **dimensionally** inspected for conformance with the applicable specifications prior to testing.

2.2 TEST PROCEDURE

A visual and dimensional inspection **was** performed to determine compliance with NASA drawing 10430405 and to the applicable vendor drawings, to the **extent** possible without disassembly of the specimens. At the **same** time, each specimen **was also** inspected for poor **workmanship** and manufacturing defects.

2.3 TEST RESULTS

The specimens were found to conform with all applicable drawings and specifications.

SECTION III

PROOF PRESSURE TEST

3.1 TEST REQUIREMENTS

- 3.1.1 The test specimens shall be pressurized to 4500 psig for 5 minutes, using gaseous helium as the test medium.
- 3.1.2 The specimens shall be inspected for leakage and external damage ■

3.2 TEST PROCEDURE

- 3.2.1 Each specimen **was** installed in the test setup as shown in figure 3-1, using the equipment listed in table 3-1.
- 3.2.2 The specimen was pressurized to the rated proof pressure by closing hand valve 5 and adjusting pressure regulator 3.
- 3.2.3 The specimen **was** checked for leakage during the 5 minute period by monitoring gage 4 for an indication of a pressure drop at the specimen. The initial and final pressures were recorded.
- 3.2.4 Pressure regulator 3 **was** closed and hand valve 5 was opened to depressurize the specimen.
- 3.2.5 The specimen was removed from the test setup and inspected for damage.

3.3 TEST RESULTS

There was no leakage of the test specimens and there was no evidence of internal **or** external damage.

3.4 TEST DATA

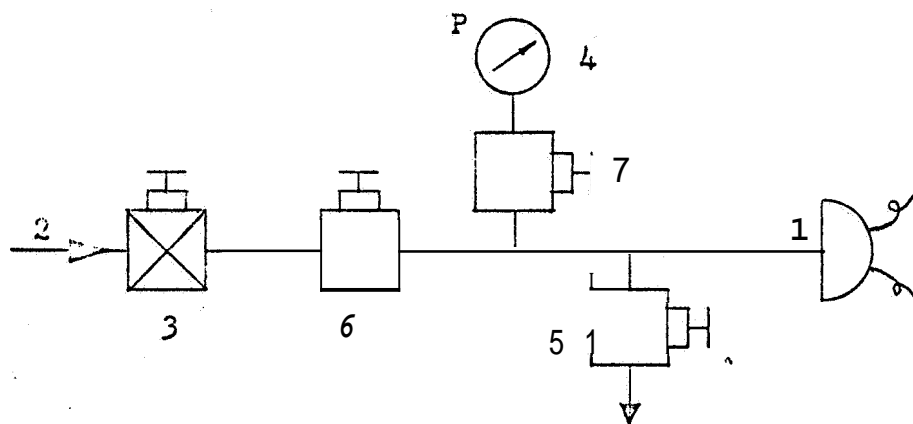
The data presented in table 3-2 were recorded during the test.

Table 3-1. Proof Pressure Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Custom Components Switches, Inc.	8G46-1	001, 002, and 003	Pressure switch
2	Dry Air	NA	NA	NA	4500-psig
3	Pressure Regulator	Tescom Corp.	26-1002	1009	6000-psig
4	Pressure Gage	Duragauge	NA	NA	0-to 10,000-psig +0.5% FS Cal date 3-7-67
5	Relief Valve	Robbins	ANA 250-4T	NA	1/4-inch
6	Hand Valve	Robbins	ANA 250-4T	NA	1/4-inch
7	Hand Valve	Robbins	ANA 250-4T	NA	1/4-inch

Table 3-2. Proof Pressure Test Data

Specimen	Pressure (psig)	Time (Minutes)	Leakage	External Damage
1	4500	5	None	None
2	4500	5	None	None
3	4500	5	None	None



Note: Refer to table 3-1 for item identification

All line sizes $\frac{1}{4}$ - inch.

Figure 3-1. Proof Pressure Test Schematic

a

SECTION I V

FUNCTIONAL TEST

4.1 TEST REQUIREMENTS

- 4.1.1 Actuation of the test specimen shall occur on increasing pressure at 15 (± 5) psig.
- 4.1.2 Deactuation of the test specimen shall occur on decreasing pressure either at or before 5 psig.
- 4.1.3 Contact voltage drop **across** the normally open **and** the normally closed contacts shall not exceed 300 millivolts ~~when~~ a 1 ampere, 28-vdc resistive load is applied to the contacts (contacts in closed position) .
- 4.1.4 The insulation resistance, when measured between all non-connected pins and between each pin and the case, shall not be less than 20 megohms with 500-vdc applied.
- 4.1.5 The dielectric strength, when measured between all nonconnected pins and between each pin and case, shall be such that the leakage current shall not exceed 3 milliamperes when 1000 vac (*rms*), 60 cps is applied. (Use 1000 vac **only** during initial functional test, 500 vac during all other functional tests.)

4.2 TEST PROCEDURE

- 4.2.1 Each specimen ~~was~~ installed in the test setup as shown in figures 4-1 and 4-2, using all the equipment listed in table 4-1 except ~~items~~ 9 through 13.
- 4.2.2 Hand valves 3 and relief valve 5 were opened **and** the system was purged of air using a low flow ~~from~~ the regulated pressure source.
- 4.2.3 Relief valve 5 was closed and the regulated source pressure **was slowly** increased until the specimen actuated, The actuation pressure **was** recorded.
- 4.2.4 The regulated source pressure **was** slowly decreased until the specimen deactuated. The deactuation pressure **was** recorded and the pressure was reduced to zero.
- 4.2.5 Procedures 4.2.3 and 4.2.4 were repeated until the ~~specimen~~ was actuated **and** deactuated ten times,
- 4.2.6 Lamps 7 and 8 were removed from the test setup **and** replaced with load banks 12 ~~which~~ were adjusted to 1 ampere loads at 28-vdc.

- 4.2.7 Differential voltmeter 9 was connected across pins A and B of J1, and the contact voltage drop across the normally closed contacts was measured and recorded.
- 4.2.8 The differential voltmeter was disconnected and the regulated source pressure was increased slowly until the specimen actuated.
- 4.2.9 Differential voltmeter 9 was connected across pins B and C of J1 and the contact voltage drop across the normally open contacts was measured and recorded.
- 4.2.10 The electrical circuitry of the test setup was removed by disconnecting P1 (figure 4-2) and the regulated source pressure was reduced to zero.
- 4.2.11 Megohmmeter 11 was connected to pins B and C of J1, and with 500-vdc applied to the pins the insulation resistance was measured and recorded.
- 4.2.12 Megohmmeter 11 was connected to pins A and B of J1 and the test specimen was actuated. The 500 vdc test voltage was applied and the insulation resistance was measured and recorded.
- 4.2.13 The insulation resistance between each pin of J1 and the test specimen case was measured and recorded by applying 500-vdc between the pins and case.
- 4.2.14 The megohmmeter was removed and the insulation tester 10 was connected between pins A and C of J1 and the specimen case with the test specimen in the actuated position.
- 4.2.15 The test voltage was gradually increased from zero to 1000 vac (rms) and was maintained for 60 seconds. The highest leakage current was recorded.
- 4.2.16 The regulated source pressure was reduced to zero and the insulation tester was connected between pins C and A of J1 and the specimen case. Step 4.2.15 was then repeated.

4.3 TEST RESULTS

- 4.3.1 The specimens operated at the levels specified in 4.1.1 and 4.1.2.
- 4.3.2 The contact voltage drop was less than 300 millivolts for all measurements.
- 4.3.3 The insulation resistance was greater than 20 megohms for all measurements.
- 4.3.4 The dielectric strength (leakage current) was less than 3 milli-amperes for all measurements.

4.4

TEST DATA

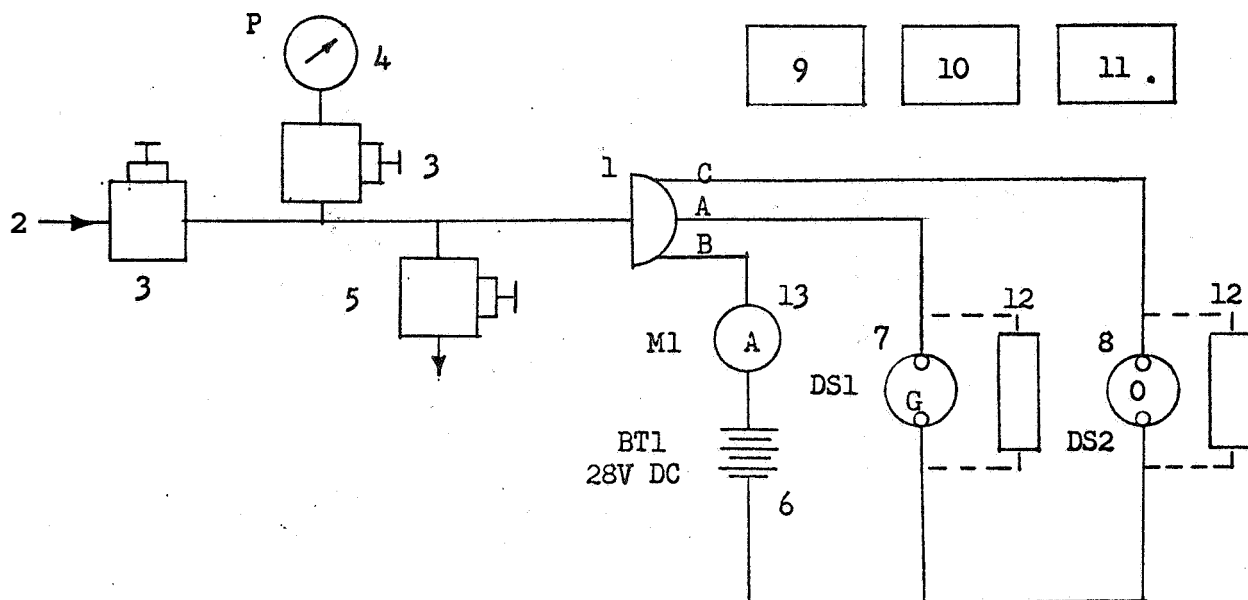
Data recorded during the initial functional test are presented in table 4-2.

Table 4-1. Functional Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimens 1, 2, and 3	Custom Components Switches, Inc.	8G46-1	001, 002, and 003	Pressure switch
2	Regulated Dry Air Source	NA	NA	NA	30-psig
3	Hand Valve	Grove	10903A	NA	1/4-inch
4	Pressure gage	Heise	H39703	NA	0-to 30-psig +0.1% FS Cal date 5-6-67
5	Relief Valve	Robbins	ANA 250-4T	NA	1/4-inch
6	Power Source	Lambda	LA5003B	010270	28-vdc, 1-amp
7	Lamp (DS1)	General Electric	327	NA	Green
8	Lamp (DS2)	General Electric	327	NA	Orange
9	Differential Voltmeter	John Fluke	821A	156	+0.17% FS
10	Insulation Tester	Wiley	5	015241	
11	Megohmmeter	General Radio	1862-B	01845	
12	Load Bank	CCSD	NA	NA	1-amp, 28-vdc
13	Ammeter	Simpson	NA	NA	0-to 10-amp +1% FS (built into load banks)

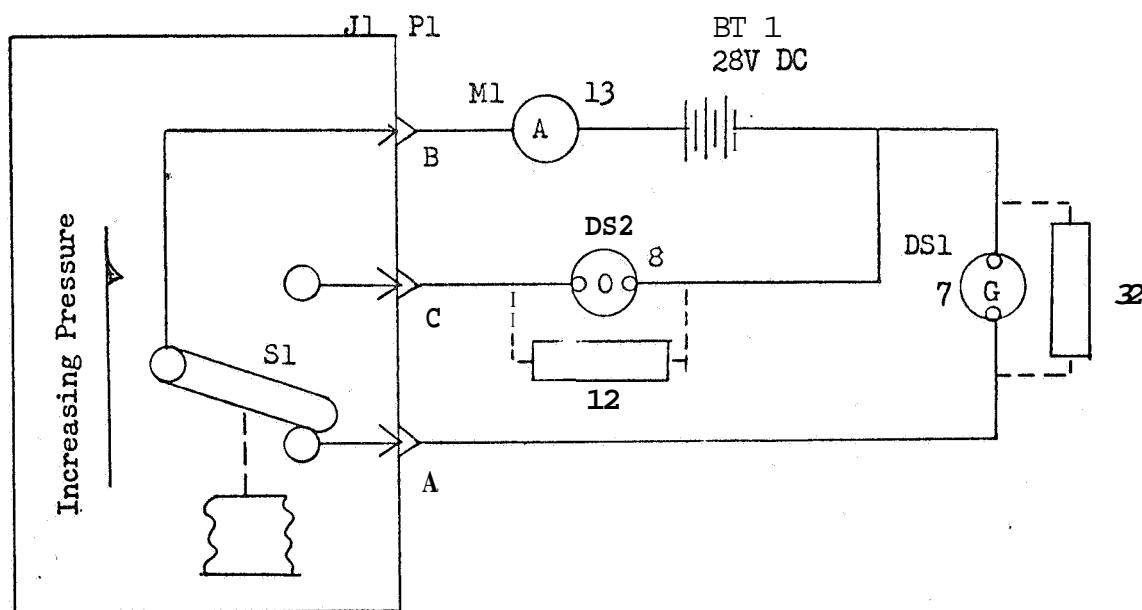
Table 4-2. Initial Functional Test Operating Pressures

Specimen	Serial Number	Average Actuation Pressure (psig)	Specified Actuation Pressure (psig)	Average Deactuation Pressure (psig)	Specified Deactuation Pressure (psig min)
1	001	11.1	15 \pm 5	8.2	5
2	002	11.6	15 \pm 5	7.2	5
3	003	12.2	15 \pm 5	6.8	5



Note: Refer to table 4-1 for item identification.
All lines $\frac{1}{4}$ inch.

Figure 4-1. Functional Test Schematic



Note: Refer to table 4-1 for item identification.
All lines $\frac{1}{4}$ inch,

Figure 4-2. Functional Test Wiring Schematic

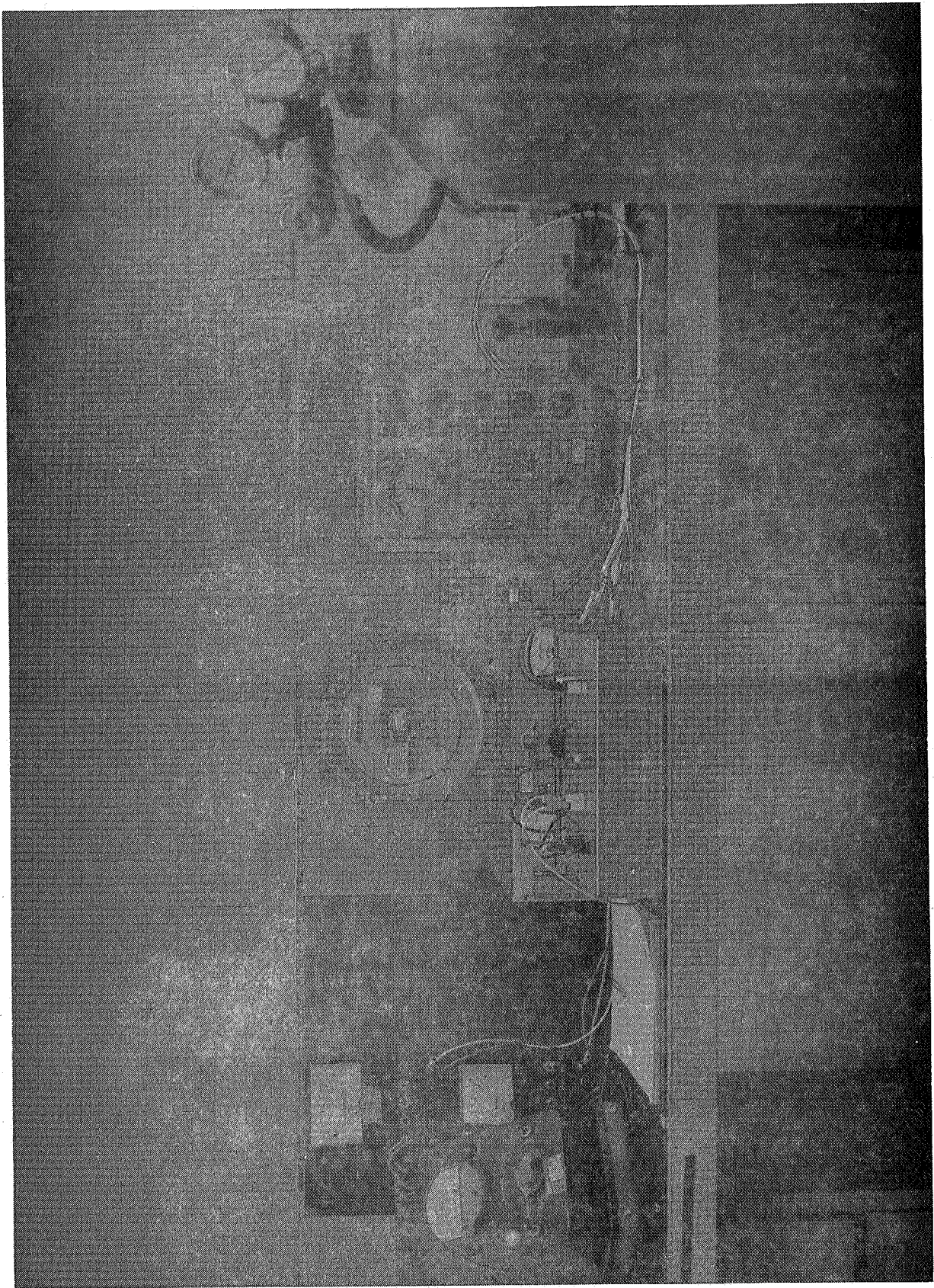


Figure 4-3. Functional Test Setup

SECTION V

VIBRATION TESTS

5.1 TEST REQUIREMENTS

- 5.1.1 A vibration test shall be performed on test specimens 1 and 3 to determine the capability of the specimens to operate satisfactorily during and after being subjected to vibration,
- 5.1.2 The tests shall be performed in the horizontal and vertical axes. (See figure 5-1)
- 5.1.3 Acceleration input to the specimens shall be measured by accelerometers mounted on the specimens.
- 5.1.4 The test specimens shall be pressurized to 20 psig during the 5-to 3000-cps portion at the resonant frequency search and during the 10-to 2000-cps portion of the sinusoidal sweep tests. A 1-ampere load will be applied through pins B and C of J1 and the voltage across pins B and C shall be continuously monitored.
- 5.1.5 The test specimens shall be depressurized during the 3000-to 5-cps portion of the resonant frequency search and during the 2000-to 10-cps portion of the sinusoidal sweep tests. A 1-ampere load will be applied through pins B and A of J1 and the voltage across pins B and A shall be continuously monitored.
- 5.1.6 The test specimens shall be pressurized to 20 psig during the first 4 minutes and pneumatically operated as many times as practicable during the last minute of the random excitation test.
- A 1-ampere load will be applied through pins B and C and pins B and A of J1 and the voltage drop across pins B and C and across pins B and A shall be continuously monitored.
- 5.1.7 The resonant frequency search, sinusoidal sweep, and random excitation tests constitute one axis of vibration and shall be completed before going to the next axis.
- 5.1.8 The tests shall be conducted in accordance with section 9, procedure I of KSC-STD-164(D).

5.1.9 A functional test shall be performed prior to the vibration tests and immediately following the sinusoidal sweep and random excitation test in each axis.

5.2 TEST PROCEDURE

5.2.1 The specimens were installed on a vibration fixture and the fixture was mounted on the vibrator. All necessary electrical and pneumatic systems were connected.

5.2.2 A functional test was performed as prescribed in section IV.

5.2.3 The resonant frequency search was performed while vibrating the test specimens at the input levels specified in table 5-1. The specimens were pressurized during the 5 to 3000 cps portion and depressurized during the 3000 to 5 cps portion.

5.2.4 The sinusoidal sweep test was performed by vibrating the specimens at the levels specified in table 5-1. The specimen contacts were monitored for chatter with the test specimen pressurized from 10 to 2000 cps and depressurized from 2000 to 10 cps.

5.2.5 A functional test was performed according to section IV.

5.2.6 The random excitation test was performed by vibrating the test specimens at the levels specified in table 5-1. The specimen contacts were monitored for chatter with the test specimens pressurized for the first four minutes. They were pneumatically operated as many times as practicable during the last minute of vibration.

5.2.7 A functional test was performed according to section IV.

5.3 TEST RESULTS

5.3.1 Test specimens 1 and 3 operated properly during all the vibration functional tests,

5.3.2 No contact chatter was detected during the vibration tests.

5.4 TEST DATA

5.4.1 Data recorded during the vibration functional tests are recorded in tables 5-2 and 5-3.

5.4.2 A sinusoidal input plot (acceleration versus frequency), typical of all axes, is presented in figure 5-2.

5.4.3 A typical random equalization plot is presented in figure 5-3.

Table 5-1. Vibration Test Levels

Vibration Test	Time (Minutes)	Frequency (cps)	Input Level
Resonant Frequency Search	15	5-63 63-2000 3000-63 63-5	0.01 inch DA 2.0g peak 2.0g peak 0.01 inch DA
Sinusoidal Sweep	15	10-63 63-2000 2000-63 63-10	0.1 inch DA 20g peak 20g peak 0.1 inch DA
Random	5	10-100 100-1000 1000-2000	+6 db/octave 0.05 g ² /cps -6 db/octave

Table 5-2. Functional Test Operating Pressures Obtained Before Vibration Tests

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Actuation Pressure (psig)	Average Deactuation Pressure (psig)	Specified Deactuation Pressure (psig min)
1	001	11.2	15 \pm 5	8.0	5
3	003	13.6	15 \pm 5	6.9	5

Table 5-3. Vibration Functional Test Operating Pressures

Test Axis	Test	Specimen 1		Specimen 2	
		Average Actuation (psig)	Average Deactuation (psig)	Average Actuation (psig)	Average Deactuation (psig)
X	Sine	11.2	7.9	13.5	6.9
	Random	11.2	7.9	13.4	6.9
Y	Sine	11.2	7.5	13.5	6.6
	Random	10.8	7.5	13.4	6.4
Z	Sine	10.8	7.4	13.4	6.5
	Random	10.8	7.5	13.4	6.5

Specification Levels

Actuation: 15 \pm 5 psig

Deactuation: 5 psig min.

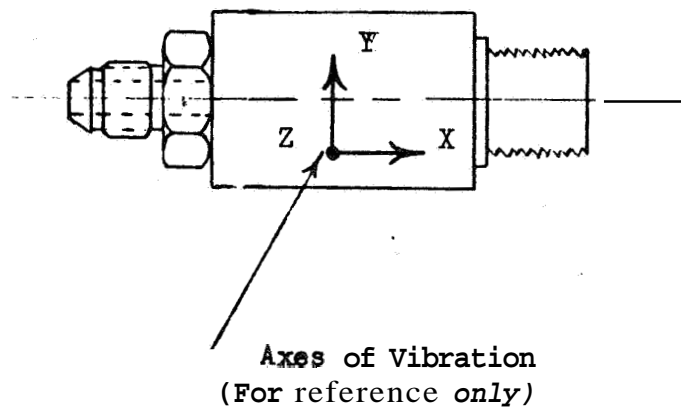


Figure 5-1. Axes of Vibration

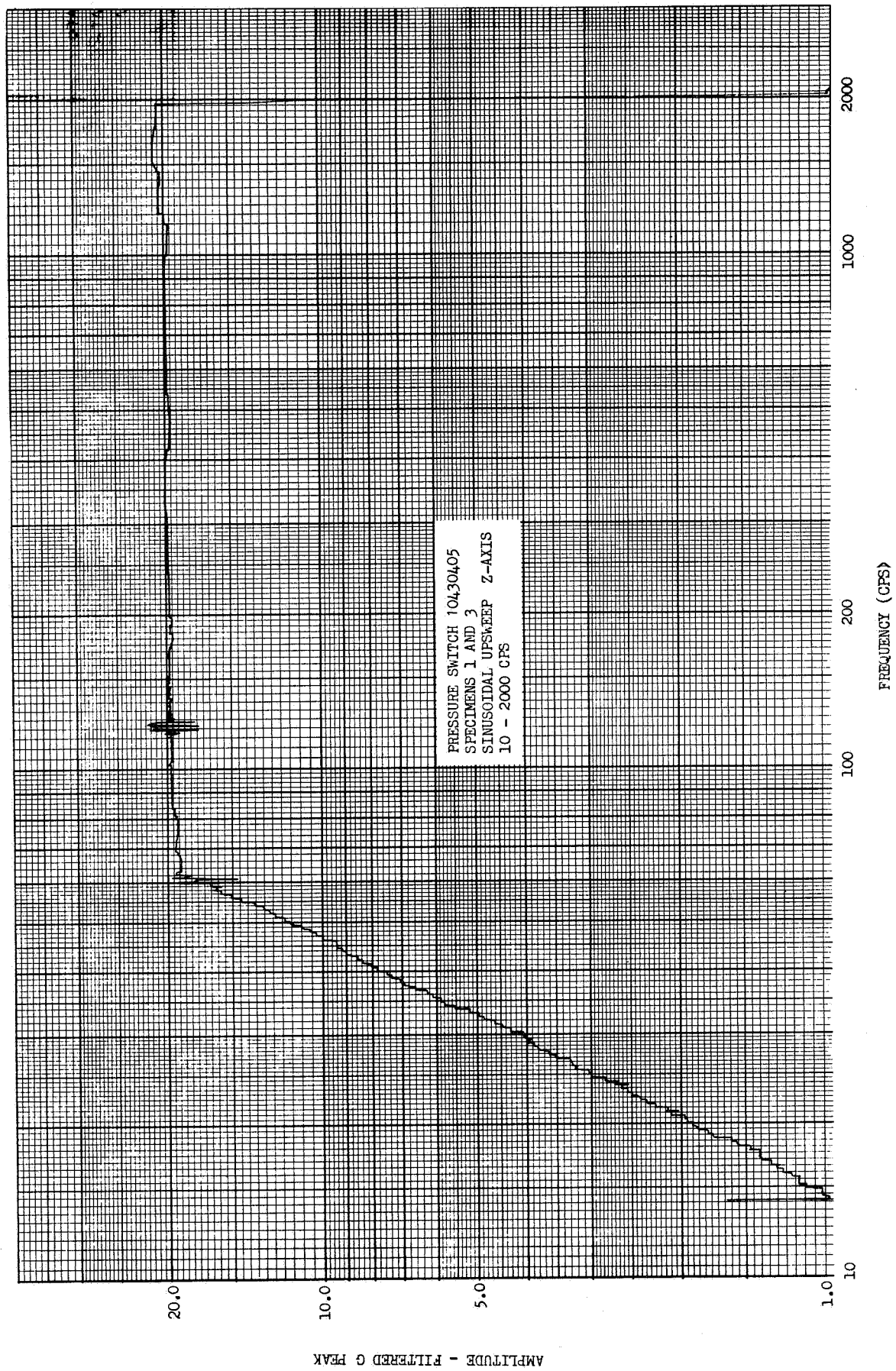
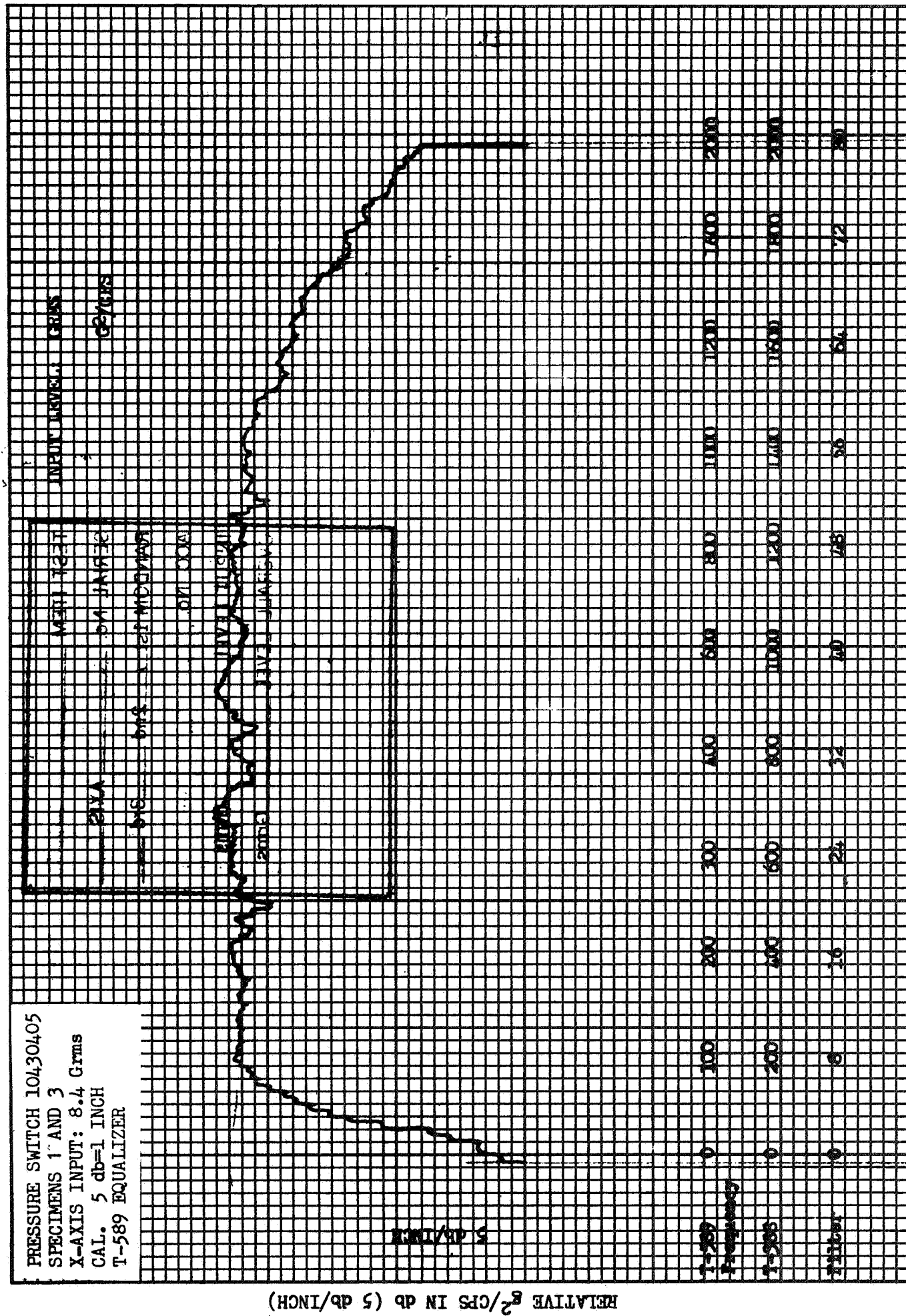


Figure 5 ~ Typical Vibration Plot (Control Accelerometer)

PRESSURE SWITCH 10430405
SPECIMENS 1 AND 3
X-AXIS INPUT: 8.4 Grms
CAL. 5 db=1 INCH
T-589 EQUALIZER



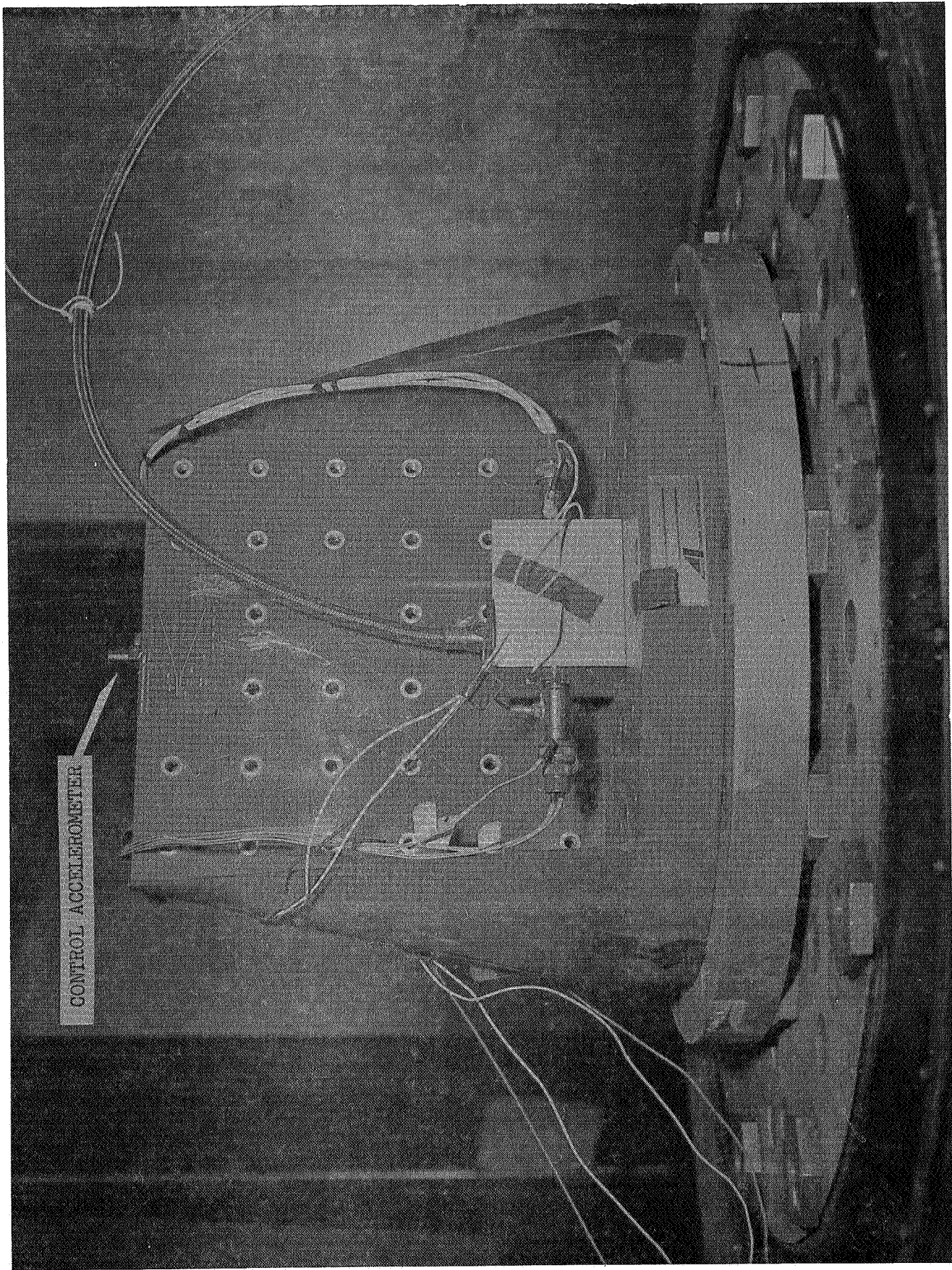


Figure 5-4. Vibration Test Setup (Y-Axis)

SECTION VI
LOW TEMPERATURE TEST

6.1 TEST REQUIREMENTS

- 6.1.1 Test specimens 1 and 3 shall be subjected to a low temperature test of 5 (+0,-4)°F to determine whether the environment causes degradation or deterioration of the specimens,
- 6.1.2 A functional test as prescribed in section IV shall be performed before the test (if more than 72 hours have elapsed since the last functional test), during the test, and within 1 hour after stabilization at ambient temperature after the test.

6.2 TEST PROCEDURE

- 6.2.1 The specimens were placed in the low temperature chamber and all necessary electrical and pneumatic systems were connected.
- 6.2.2 A functional test was performed according to section IV.
- 6.2.3 The chamber temperature was decreased at the rate of one degree per minute and stabilized at 5 (+0,-4)°F.
- 6.2.4 A functional test (refer to 5.1.2) was performed when temperature stabilization was attained.
- 6.2.5 The chamber temperature was returned to ambient upon completion of the functional test.
- 6.2.6 The specimens were visually inspected and functionally tested within 1 hour following the return to ambient.

6.3 TEST RESULTS

Specimens 1 and 3 operated properly during the functional tests and there was no apparent deterioration or degradation.

6.4 TEST DATA

Data recorded during the low temperature functional tests are presented in table 6-1.

Table 6-1. Low Temperature Functional Test Operating Pressures

Functional Test	Specimen 1		Specimen 2	
	Average Actuation (psig)	Average Deactuation (psig)	Average Actuation (psig)	Average Deactuation (psig)
Before	10.8	7.5	13.3	6.7
During	10.2	5.6	11.9	5.1
After	11.4	7.2	13.2	6.5

Specification Levels

Actuation: 15 (± 5) psig

Deactuation: 5 psig min.

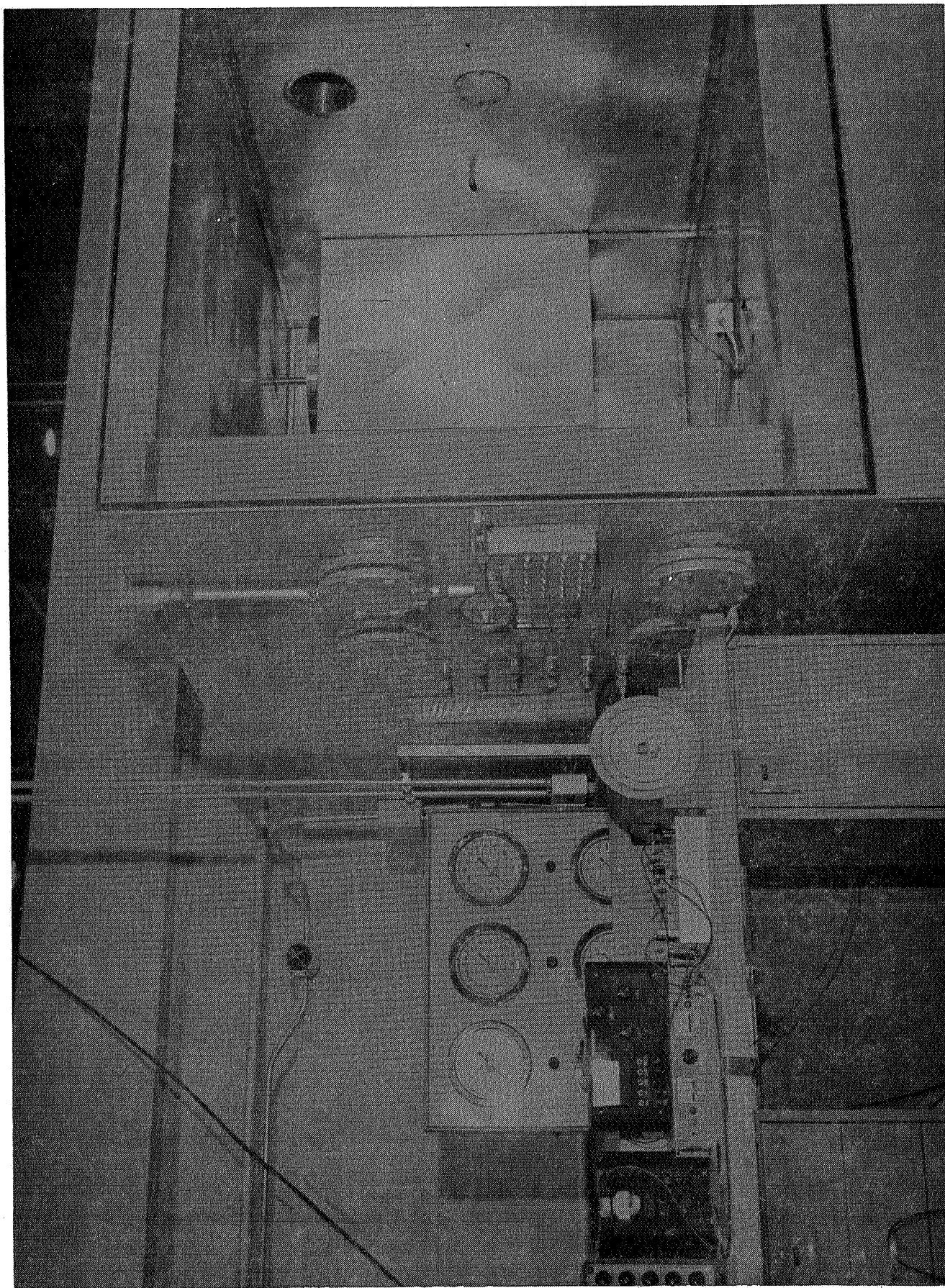


Figure • Temperature Test Setup

SECTION VII

HIGH TEMPERATURE TEST

7.1 TEST REQUIREMENTS

- 7.1.1 Test specimens 1 and 3 shall be subjected to a high temperature test of 160 (+4,-0)°F to determine whether the environment causes degradation or deterioration of the specimens.
- 7.1.2 A functional test as prescribed in section IV shall be performed before the test (if more than 72 hours have elapsed since the last functional test) during the test, and within 1 hour after stabilization at ambient temperature after the test.
- 781.3 The temperature shall be stabilized at 160 (+4,-0)°F and maintained for 72 (+2,-0) hours.

7.2 TEST PROCEDURE

- 7.2.1 The test specimens were placed in the high temperature chamber and all necessary electrical and pneumatic systems were connected.
- 7.2.2 The chamber temperature was increased at the rate of one degree per minute and stabilized at 160 (+4,-0)°F. This temperature was maintained for 72 hours.
- 782.3 A functional test as outlined in 7.1.2 was performed after the 72 hour period had elapsed.
- 7.2.4 The chamber temperature was returned to ambient upon completion of the functional test.
- 7.2.5 The test specimens were visually inspected and functionally tested within 1 hour following the return to ambient.

783 TEST RESULTS

Specimens 1 and 3 operated properly during the functional tests. There was no apparent deterioration or degradation of the specimens.

7.4 TEST DATA

Data recorded during the high temperature functional tests are presented in table 7-1.

Table 7-1. High Temperature Functional Test Operating Pressures

Functional Test	Specimen 1		Specimen 2	
	Average Actuation (psig)	Average Deactuation (psig)	Average Actuation (psig)	Average Deactuation (psig)
Before	11.4	7.2	13.2	6.5
During	14.1	10.3	15.1	8.7
After	11.3	7.5	12.8	6.5

Specification Levels

Actuation: 15 (± 5) psig

Deactuation: 5 psig min.

SECTION VIII

HUMIDITY TEST

8.1 TEST REQUIREMENTS

- 8.1.1 A humidity test shall be performed on test specimens 2 and 3 to determine whether the environment causes degradation or deterioration of the specimens.
- 8.1.2 The specimens shall be exposed to the humidity environment for a period of 240 hours.
- 8.1.3 A functional test as prescribed in section IV shall be performed before the test (if more than 72 hours have elapsed since the last functional test) **and** within one hour after completion of the humidity test.
- 8.1.4 The humidity test shall be conducted in accordance with section 12 of KSC-STD-164(D).

8.2 TEST PROCEDURE

- 8.2.1 A functional test **was** performed prior to placing the specimens in the humidity chamber.
- 8.2.2 The specimens were placed in the humidity chamber with the initial temperature between 68 and 100°F, uncontrolled humidity.
- 8.2.3 During the first 2 hour period the chamber temperature was **in-**creased to 160°F and the relative humidity was increased to 95 (+5,-0) per cent. The temperature and humidity were maintained for a 6 hour period.
- 8.2.4 During the **next** 16 hours the temperature **was** reduced at a linear rate to ambient while maintaining the 95 per cent relative humidity.
- 8.2.5 Procedures 8.2.3 and 8.2.4 were repeated 9 times for a total exposure **of** 240 hours.
- 8.2.6 At the conclusion of the test the specimens **were** removed from the chamber and a **functional** test **was** performed.

8.3 TEST RESULTS

Specimens 2 **and** 3 operated properly during the functional tests. There **was** no apparent deterioration or degradation of the specimens due to the humidity environment.

TEST DATA

Data recorded before and after the humidity test are presented in table 8-1.

Table 8-1. Humidity Functional Test Operating Pressures

Functional Test	Specimen 2			
	Average Actuation (psig)	Average Deactuation (psig)	Average Actuation (psig)	Average Deactuation (psig)
Before	11.2	7.2	11.8	6.9
After	11.5	7.5	12.0	7.2

Specification Levels

Actuation: 15 (± 5) psig

Deactuation: 5 psig min.

9.4

TEST DATA

Data recorded before and after the salt fog test are presented in table 9-1.

Table 9-1. Salt Fog Functional Test Operating Pressures

Salt Fog Test	Specimen 2			
	Average Actuation (psig)	Average Deactuation (psig)	Average Actuation (psig)	Average Deactuation (psig)
Before	11.5	7.5	12.0	7.2
After	11.4	7.4	11.9	7.0

Specification Levels

Actuation: 15 (± 5) psig

Deactuation: 5 psig min.

SECTION IX

SALT FOG TEST

9.1 TEST REQUIREMENTS

9.1.1 Test specimens **2** and **3** shall be subjected to a salt fog test to determine the extent, **if any**, of the degradation or deterioration resulting from the environmental exposure.

9.1.2 The salt solution shall be a **5** per cent by weight mixture and shall have a pH factor of 6.5 to **7.2**. Test temperature shall be **95 (+2,-4)°F**.

9.1.3 A functional test **as** prescribed in section IV shall be performed prior to exposure (if more than **72** hours have elapsed since the last functional test) and within **1** hour after removal from the salt fog environment.

9.2 TEST PROCEDURE

9.2.1 The specimens were inspected for corrosion, dirt, and oily films prior to the salt fog test and were cleaned before being installed in the salt fog chamber.

9.2.2 The specimens were placed in the chamber in a **manner** which would permit the fog to reach all sides of the specimens without condensate dripping on them.

9.2.3 The specimens were exposed to the **salt fog** atmosphere for 240 hours.

9.2.4 A functional test was performed according to section IV.

9.2.5 The specimens were inspected for corrosion caused by **exposure** to the salt fog atmosphere.

9.3 TEST RESULTS

9.3.1 Rust **was** present on the electrical connectors of both specimens. No corrosion **was** detected.

9.3.2 The test specimens operated properly during the functional tests performed after the salt fog test.

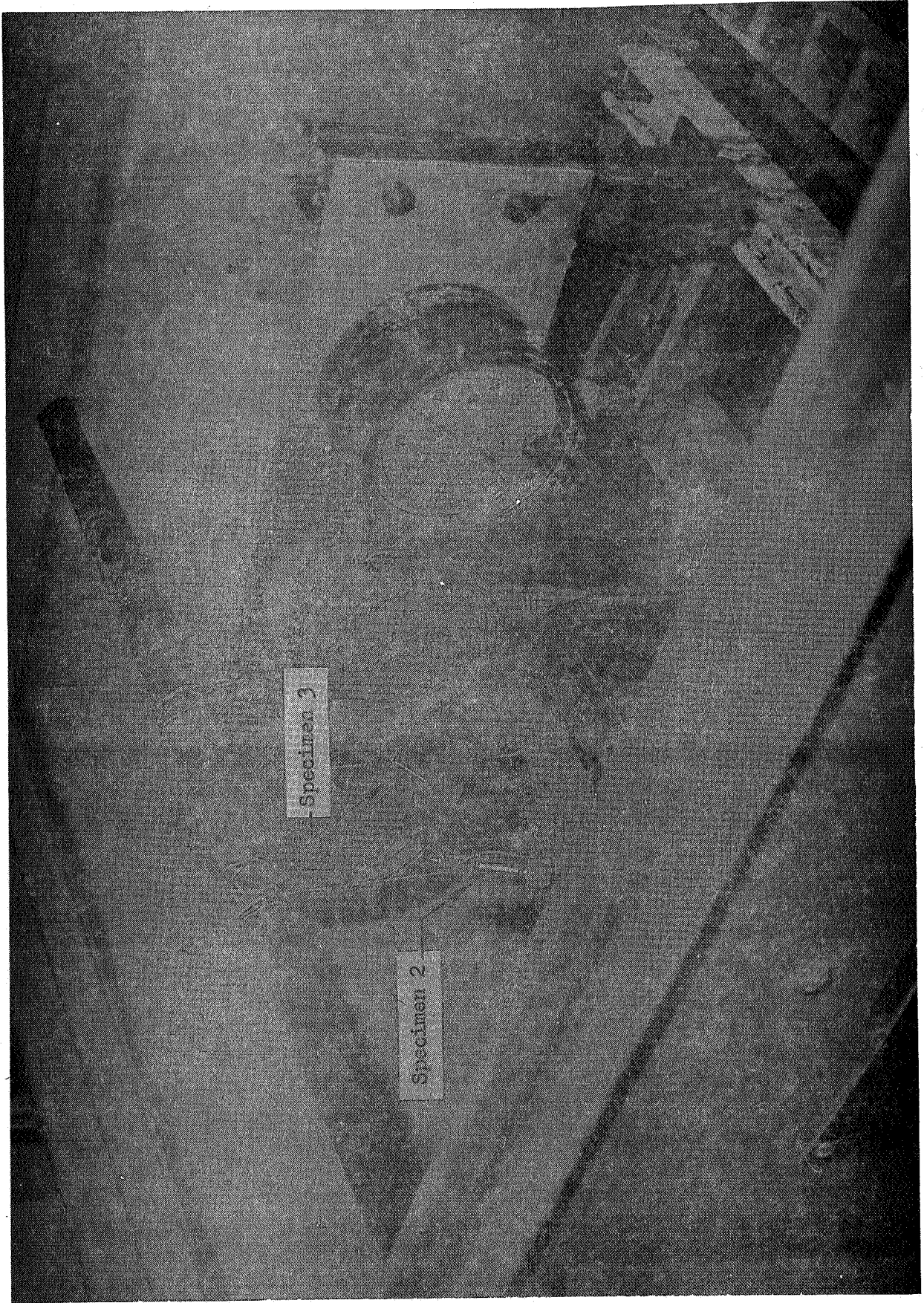


Figure 9-1. Salt Fog Test Setup

APPROVAL.

TEST REPORT

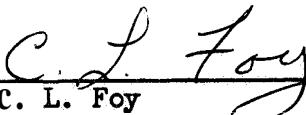
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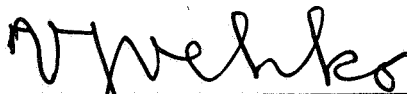


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